

HURRICANE “AMANDA”

Rediscovery of a Forgotten U.S. Civil War Florida Hurricane

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During the American Civil War, an out-of-season U.S. landfalling hurricane killed dozens but its memory in the historical record was lost amid much greater loss of life in the battlefields farther north.

The year 1863 was a pivotal year in American history as major battles between Union and Confederate forces marked a gradual and inexorable shift of fortunes in favor of the Union. The American Civil War was in its third year and news of its battles constantly filled the columns of newspapers and magazines. More than 3,000 soldiers died in early May 1863 at the Battle of Chancellorsville. Hundreds more died in the early battles at Vicksburg in late May, adding to the accumulating Civil War death total already in the tens of thousands and unprecedented in American history at that time.

Amid the manmade carnage on land, a natural disaster brought a less extensive but locally severe tragedy of lost lives to the Florida coast. On 28 May

1863 an unprecedented hurricane made landfall in northwest Florida—the only landfalling hurricane now recorded in American history in the month of May. This unusual hurricane arrived in even more unusual times. The absence of any major effect on combat readiness and the relatively localized effects of the worst damage seems to have limited the duration of the memory of this storm even locally. This paper documents its rediscovery and the effects it had on the greater drama prevailing in the country.

DATA SOURCES. We relied on the extensive series of official government documents that were printed in the late 1800s and early 1900s for written accounts of the storm. Union ship officers wrote to their superiors and to the board of inquiry investigating the storm concerning the loss of the *USS Amanda*, and there are other accounts from ships in the immediate area of the storm. These accounts provided details that are not available in the extant logbooks. The pertinent accounts were published in the 1903 volume (U.S. Navy Department 1903). We also used the original logbooks of the U.S. Navy located at the National Archives in Washington, D.C. In addition, we made use of land-based weather records held in Records Group 27 at the National Archives in College Park, Maryland, which consists of U.S. Army fort records and cooperative observers of the Smithsonian

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Institution (Fleming 1990). Newspaper accounts are from the U.S. Library of Congress Newspaper Library in Washington, D.C., and the newspaper microfilm collections at the University of Maryland in College Park. Online sources for newspaper records from Louisiana, Georgia, and Florida included the Jefferson Parish Library (www.jefferson.lib.la.us/index.htm), Georgia historical newspapers (<http://enquirer.galileo.usg.edu>), and the Florida Digital Newspaper Library (<http://ufdcweb1.uflib.ufl.edu>).

A MAJOR STORM ON A MINOR FRONT. In late May 1863, the Gulf coast of northwest Florida was blockaded by the Union Navy's East Gulf Blockading Squadron, which operated from Pensacola eastward through the Florida Straits in an attempt to slow the flow of goods and war material in and out of Confederate ports (Weddle 2002). At least one Union ship was posted for blockading duties in or near Hurricane Inlet (Panama City), St. Joseph's Bay, the West and East Passes of St. George Sound, St. Mark's, Cedar Key, Tampa Bay, and Port Charlotte. Navy facilities in Pensacola and Key West were also in Union possession. Figure 1 depicts these locations and the ships on station as well as those at sea on the morning of 28 May 1863.

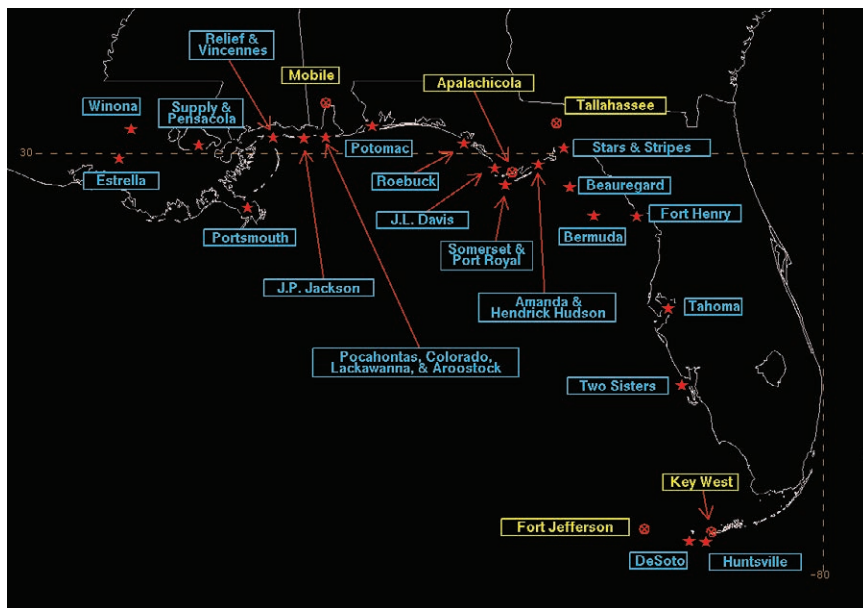


FIG. 1. Map depicting the location and name of U.S. Navy ships blockading the Confederate ports along the Gulf of Mexico from Louisiana to Florida on 28 May 1863 for which logbooks are available and used in this study. The only nonextant logbook shown here is that of the *Port Royal*. The weather data from the logbooks from these ships, along with newspaper accounts and other sources, were used to reconstruct the track of the hurricane. Cities mentioned in the text and Fort Jefferson, where a weather record was taken and used in this study, are also included.

St. George Sound (Apalachicola Bay) is the waterway connecting the city of Apalachicola, Florida, to the Gulf of Mexico. The Apalachicola River empties into the sound and steamboats in the nineteenth century traveled as far north as Columbus, Georgia. This city became an important industrial center for the Confederacy during the Civil War and defense against possible Union incursions up the river led to the construction of warships for the Confederate Navy. The CSS *Chattahoochee* was constructed in late 1861 and 1862 and was finally delivered to the Confederate Navy from the shipyard in November 1862. By late May 1863, she was located at Chattahoochee, Florida, on the border with Georgia (Turner 1988; Watts et al. 1990).

On 24 May, Union troops captured the schooner *Fashion*, loading cotton on the river north of Apalachicola, and towed it down to the Gulf of Mexico. News of its capture led to the decision to take the *Chattahoochee* down the river although it was in no position to directly challenge Union forces unless it could pass obstructions placed into the river to prevent Union ships from moving upriver (*New York Times*, 24 June 1863). On 26 May, the gunboat sailed down to Blountstown Bar and waited overnight for a possible rise in water (Watts et al. 1990),

the water being lower than normal at that season of the year following a drier than normal spring. Presumably, if the water level had been high enough the ship might have attempted to navigate around the obstructions to engage the Union fleet, but this can only be speculation at this point.

The following day the *Chattahoochee* was about to head back from Blountstown to the town of Chattahoochee because of low water in the river when the boilers exploded, killing 14 people outright; several more would die from their wounds soon after. [The gunboat sank and remained in the river below Blountstown until mid-August when the wreck was recovered and returned to Chattahoochee

(Watts et al. 1990).] It was not until about 12 hours after the midday boiler explosion on 27 May that another steamer arrived at the scene to transport survivors back to Chattahoochee. By that night heavy rain and strong winds had overspread the area, which would eventually lead to a rise in all the region's rivers. The Commander of the Confederate Navy Yard at Columbus wrote in a 15 June 1863 letter "The dead and wounded were taken on shore, where they remained until the next afternoon (May 28), most of the time a terrible storm raging" (Campbell 2008). For the wounded, many lying in the open with little protection from the elements of a gathering hurricane, it was a miserable and painful experience with little medical care that could be provided to those scalded by the water from the boilers.

WRECK OF THE BARK USS AMANDA. Four U.S. Navy ships were on station on either side of St. George Sound. The steam gunboat *USS Port Royal* and gunboat *USS Somerset* were stationed at the West Pass of the sound while the bark *USS Amanda* and the steamer *USS Hendrick Hudson* were stationed at the East Pass of St. George Sound. Ships at both locations experienced hurricane force winds for several hours and at West Pass it dismasted and drove ashore the barge *Andrew Manderson* onto Sand Island while the sloop *Brockenburgh* was driven ashore on St. Vincent's Island. Both the *Somerset* and *Port Royal* were able to ride out the hurricane, but not without difficulty (U.S. Navy Department 1903).

On the East Pass, off Dog Island, both the *Amanda* and *Hendrick Hudson* experienced even worse hurricane conditions. Figure 2 shows the *Hendrick Hudson* at anchor, taken sometime between 1862 and 1864. The *Amanda* initially grounded on the west point of Dog Island (where the sea made a complete breach and carried off all of the coal stored there). However, a shift of wind to the southeast drifted the bark into the sound and carried it on a northwest drift toward the mainland where she grounded in mud flats about 7 a.m. A sense of the confusion and danger that took place as the ship neared shore can be found in the original logbook of the *Amanda*, where the wind and weather data for the hours of 5 a.m. through 8 a.m. are mistakenly recorded as 8 a.m. through 11 a.m. This

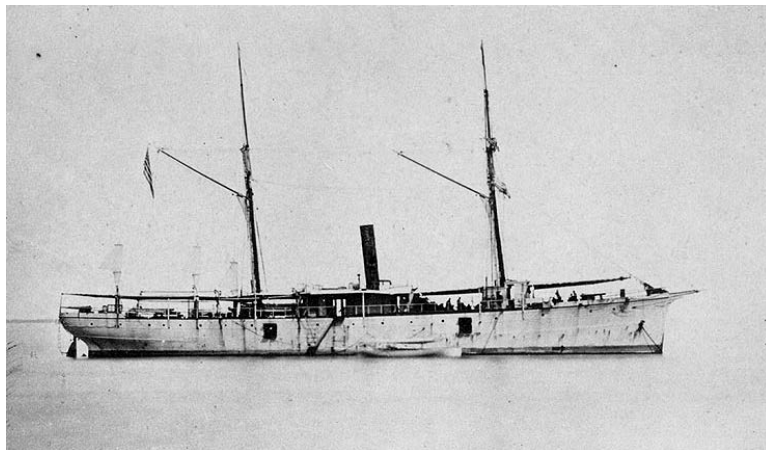


FIG. 2. The *USS Hendrick Hudson*, at anchor, sometime from 1862 to 1864. The screw steam gunboat was collocated with the *USS Amanda* during the hurricane of May 1863 at the East Pass of St. George Sound, Florida. Image source: U.S. Department of the Navy, Naval Historical Center, Washington, D.C.

could be either an error in the original chalk slate log where the readings would normally be first recorded or in a transcription from the slate log to the logbook. A comparison of the nearly collocated *Hendrick Hudson*'s logbook confirms the transcription error.

Acting Volunteer Lieutenant George E. Welch quickly, and controversially, ordered the abandonment and firing of the ship, as well as destroying the ships' guns, having claimed to see Confederate forces nearby and thereby considering the position of the *Amanda* indefensible (U.S. Navy Department 1903). The focusing of the crew's attention on a feared Confederate attack and the firing of the ship can be seen in the subsequent log entries of the weather aboard the *Amanda*, which are less frequent and complete until the log ends later on the afternoon of 29 May. However, according to a note recorded at the bottom of the entry for 29 May the log entries for the last day were recorded from the log slate onto a sheet of paper, but this was lost in the confusion and recorded from memory after the fact. The poor agreement of the instrumental weather data with that of the collocated *Hendrick Hudson* logbook casts doubt to the accuracy of the other accounts of the ship's firing made from memory.

A court of enquiry held in June 1863 in Key West could find no corroborating evidence from any witnesses on either the *Amanda* or the *Hendrick Hudson* that any Confederate troops were seen at all. The court found that Lt. Welch's decision to abandon the ship was probably taken too easily and that Acting Volunteer Lt. Cate, of the *Hendrick Hudson*, as the senior of the two officers, also seemed to express

little interest in overriding the decision to destroy the *Amanda*, a decision that rightly should have been of concern to him (U.S. Navy Department 1903).

The court also wrote “What took place subsequently on board the HH, on her spar deck and in the presence of all hands—see the record—and which, under the precept, became a proper subject of enquiry) will go far to show the revising power the weight that was attached to rank and seniority in this instance, and it does not satisfactorily account for the reticence of Acting Volunteer Lt. Cate of assuming all his prerogatives, but will, to a certain extent, account for and palliate the only instance of insubordination reported on the part of a portion of the *Amanda*’s crew” (U.S. Navy Department 1903).

Following the hearing, Acting Rear Admiral Bailey ordered Captain Welch back north and to report to the Navy Office in Washington. He granted a request for a leave of absence by Lt. Cate who “not only on account of his inefficiency on the occasion of the *Amanda*’s disaster but also on account of the general disorganization of his vessel” left the admiral thoroughly unimpressed (U.S. Navy Department 1903).

METEOROLOGICAL ANALYSIS. The hurricane moved due northward toward the Apalachicola area during the daylight hours of 27 May. Landfall on the barrier islands late that night and the mainland about sunrise 28 May (Fig. 3). The western

edge of the eyewall appears to have brushed the *USS Somerset* located off the west end of St. George Island in the West Pass of St. George Sound. A northeast hurricane began to moderate at 3:30 a.m. on 28 May and the wind went around gradually to the west; at daylight during the calmer weather the barge *Andrew Manderson* was spotted dismantled and ashore on Sand Island (at the tip of the west end of St. George Island) and the sloop *Brockenburgh* ashore on St. Vincent’s Island. At 6 a.m. the wind again increased to a hurricane, the wind blowing from the west-southwest and the *Somerset* hove up all anchors and stood to leeward of Sand Island (U.S. Navy Department 1903).

Neither the *Amanda* nor the *Hendrick Hudson* experienced any diminished wind force during the hurricane. At 2 a.m. the pressure was 29.20 inches (uncorrected; 29.25” corrected for elevation, gravity, temperature, and latitude; equivalent to ~991 hPa), and the wind from the southeast was at force “11+” with heavy rain. The written comments in the log also indicate that at 3:20 a.m. the wind hauled suddenly to southeast (from east-northeast at 1 a.m.) and the vessel then began to float off the west point of Dog Island to the northwest. The lowest pressure and strongest winds recorded in the *Amanda*’s logbook were at 5 a.m. with an uncorrected reading of 28.74” (28.79” or 975 hPa corrected) and winds of force “12+” from the SSE. At 7 a.m. the pressure was up slightly to 28.80” (28.85” or 977 hPa corrected) with

a south wind and at about this time the *Amanda*, which had drifted across the sound from the west end of Dog Island, was aground in mud flats on the mainland some three or more miles from the *Hendrick Hudson*.

The *Hendrick Hudson* reported a lowest pressure of 28.74” (29.00” or 982 hPa corrected) at 4 a.m. while at Dog Island, riding out the hurricane. The wind force at 3 a.m. was 12 from the east-southeast and at 8 a.m. was still blowing a force 12 hurricane with the wind from the southwest. At 6 a.m. the pressure had risen to 29.04” (29.30” or 992 hPa corrected). By this

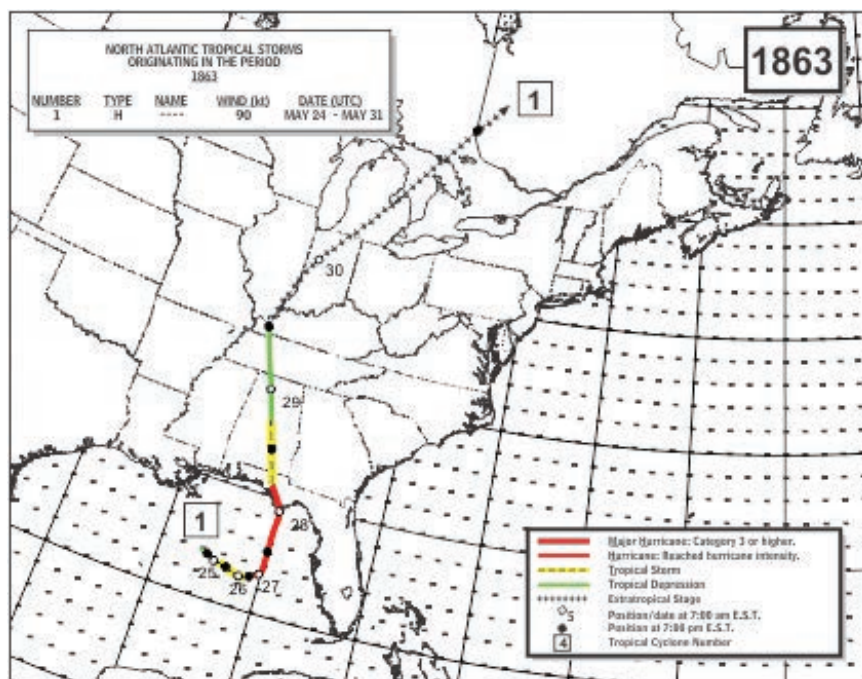


FIG. 3. Track of Hurricane Amanda from 24 to 31 May 1863.

TABLE 1. Noon temperatures (degrees Fahrenheit) recorded on board 11 U.S. Navy ships from Louisiana to northern Florida on 26–30 May, centered on the date of the landfall of Hurricane Amanda on 28 May. The original value of “63” on 28 May recorded by the USS *Colorado* is corrected to “73” based on the surrounding data and the likelihood of a misreading of the thermometer or a transcription error in the log. The ship also is much cooler than other ships near Mobile Bay during the entire month. The 28–30 May values for the *Amanda* are estimated based on its average noon temperature difference from that recorded on the collocated *Hendrick Hudson* for the 20 days of overlap that month. The *Beauregard* was at Cedar Key on 26 and 27 May and off the coast of St. Marks by 30 May. All data are taken directly from the original logbooks on file at the U.S. National Archives, Washington D.C.

Ship	Location	26 May	27 May	28 May	29 May	30 May	Average temperature
<i>Amanda</i>	St. George Sound	80	78	75	78	84	79
<i>Hendrick Hudson</i>	St. George Sound	76	73	71	74	80	74.8
<i>Fort Henry</i>	Cedar Key	87	80	78	77	79	80.2
<i>Beauregard</i>	Cedar Key to St. Marks	81	80	79	82	82	80.8
<i>Colorado</i>	Entrance Mobile Bay	80	74	73	78	74	75.8
<i>Pocahontas</i>	Entrance Mobile Bay	75	77	74	75	78	75.8
<i>Potomac</i>	Entrance Mobile Bay	71	79	73	77	73	74.6
<i>Lackawanna</i>	Entrance Mobile Bay	72	81	78	85	76	78.4
<i>Vincennes</i>	Ship Island, MS	77	77	74	79	76	76.6
<i>Portsmouth</i>	New Orleans	78	82	80	90	82	82.4
<i>Winona</i>	Plaquemines, LA	85	85	85	78	90	84.6
Average of all 11 ships		78.4	78.7	76.4	79.4	79.5	78.5
Average without warmest and coldest ships		78.2	78.7	76.0	78.8	79.0	78.2

time the center of the hurricane had made landfall on the mainland.

Table 1 presents the noon temperature data recorded on 11 U.S. Navy ships from 26 to 30 May, centered on the date of the hurricane landfall on 28 May. Nonstandard thermometer exposure and thermometer type and an absence of metadata concerning thermometer calibration call for caution in the interpretation of the data. Data for the full month of May 1863 (not shown) suggest that the thermometers appear to be protected from direct sunlight and some may have been located below deck in the officer’s cabins and work areas. Differences in temperatures between collocated ships are likely both random and systematic. The *Hendrick Hudson* consistently is one of the coolest and is an obvious outlier. Table 1 indicates that removal of the warmest and coolest ship each day makes little difference in the regional mean temperature. The higher temperatures in Louisiana and at Cedar Key may indicate thinner cloud cover at these times on either side of the storm center. The average temperature of 78.2°F (25.6°C) is consistent with the storm being tropical in nature. We also note that despite steady southerly winds on the day of the hurricane, ships in the area saw lower

temperatures owing in part to less direct or indirect solar radiation and possibly owing to the wetting of thermometers. The remnant low later encountered a cold front in the Mississippi Valley and moved north and then northeast before being absorbed by an extratropical low. A proposed track of Hurricane “Amanda” is given in Fig. 3.

DESTRUCTION AND DEATH ALONG THE FLORIDA COAST.

The storm came ashore on Thursday morning, 28 May, and reports of varying detail indicated a severe storm along the coast. In a letter dated 30 May from one of the editors of the Tallahassee *Floridian* to the editor of the Macon *Daily Telegraph*, it was stated “We have had a heavy blow here the past week—the heaviest I ever witnessed in Florida at this season of the year. From the coast there are various rumors of loss of life and property. I have just heard that from the Ochlockonee to Peurifoy’s Landing, twenty-one bodies of persons drowned were recovered, and eleven from Goose Creek, making thirty-two” (*Macon Daily Telegraph*, 5 June 1863). At Tallahassee, it had rained more or less every day for the previous week and so severe a gale at the time of year was not within the memory of the oldest citizen.

Wednesday night (27–28 May) the rain was literally pouring down and accompanied by a severe wind from the northeast, which shifted in the course of the night to the southwest with increased violence. (We note here that all of the available ship's log data and reports from elsewhere and the space–time continuity do not indicate that the southwest wind is representative of the prevailing winds and that it is either a simple error or associated with local convection.) The paper mentioned that at Dickerson Bay 19 persons were drowned and another 7 to 10 at Goose Creek (*Florida Sentinel*, 2 June 1863). These latter numbers are probably referring to the same deaths as communicated by the editor of the *Floridian*. His account of deaths “from the Ochlockonee to Peurifoy's Landing” would be inclusive of Dickerson Bay, which lies between the two.

Farther east, the salt works near St. Marks and Bayport were entirely destroyed. Large quantities of the salt were lost and 40 persons were drowned. The gale was said to be so strong as to have pushed the waters of the Gulf inland for several miles back into the country, inundating parts of the St. Marks railroad (*Macon Daily Telegraph* 5 June 1863, citing the *Columbus Times* of 3 June 1863). Railroad passengers arriving in Savannah reported houses blown down, fences destroyed, and, in some locations, total destruction of crops. One island in the vicinity of St. Marks was said to be submerged and a large number of persons drowned. Some of the names of the drowned were reported back to Savannah (*Macon Daily Telegraph* 5 June 1863, citing the *Savannah News* of 4 June 1863). Another letter published in the *Macon Daily Telegraph* of 5 June 1863, dated 3 June 1863 from Thomasville, Georgia, stated “the gale of Thursday is said to have done much mischief among the salt boilers on the Florida coast. One report says 150 lives were lost and many animals, much stock and salt. Hope it is not so bad; some, though, have certainly perished.”

The *Florida Sentinel* of 9 June 1863 reported that the destruction of property on the coast was greater than anticipated and stated that 32 lives were lost (probably a reference to the deaths in Goose Creek and Dickerson Bay region). The final death totals from the storm in Florida would appear to be at least 72 lives—40 in the St. Marks area and the other 32 farther west at Goose Creek and Dickerson Bay. The possibility of further storm-associated deaths on land cannot be ruled out but the available information cannot confirm the rumored report of 150 lives being lost. In addition, there were 38 deaths at sea on the *Soler* on 26 May while located about 45 miles

southeast of Mobile Bay on a voyage from Havana (*New Orleans Bee*, 3 June 1863), which brings a confirmed total of 110 dead as a direct result of the storm. We note that the *Soler's* approximate location relative to our estimated center at the time (Fig. 3) suggests a larger area of higher winds might hint at a cold core origin. The ship that picked up the survivors of the *Soler* at 28°30'N, 86°39'W on the evening of 29 May had encountered a very heavy south-southeast to southwest gale with a heavy sea setting from the west-northwest on 27–29 May while sailing from South Carolina to the area. Since the ship would have come around the Dry Tortugas, but remained in the eastern Gulf of Mexico (probably to stay nearer Union shipping to avoid Confederate privateers) this puts constraints onto the location of the hurricane and contributes to the estimated storm track. So the estimated track allows for the absence of gale reports from ships in the main shipping lane, which is consistent with the subsequent ship reports in the eastern half of the Gulf of Mexico and reports from the press of ships at sea and on land.

SUMMARY OF WEATHER ON NAVAL PROTAGONISTS. There is not often glory in combat and the protagonists in both navies were sometimes denied a chance to engage in battle by the prevailing weather conditions. The abandonment of the *Amanda* in the hurricane of 1863 was a black mark on the career of the commanders of the *Amanda* and *Hendrick Hudson* and the subsequent official investigation provides some clues to the mindsets of the Union blockaders during a period of high stress. The sheer boredom of blockading duty, punctuated by shorter intervals of potential engagement with blockade runners, was a normal feature of the war. The hurricane's unexpected arrival exposed both positive and negative features of the blockading squadron's readiness.

The Confederate force's ability to engage in warfare was also tested by the weather. The *Chattahoochee's* fate in 1863 appears to have been an unfortunate accident. The men involved performed the rescue and salvaging of the ship as well as could be expected given the circumstances. The gunboat had been plagued by production faults for virtually its entire life and the men were likely victim to an accumulation of human errors that contributed to the faulty pressure gauge reading causing the steamer's destruction. While rain is likely to have been falling at the time of the disaster the worst of the weather was still some hours away and the contribution of the weather at the time of the boiler explosion is unknown.

The weather further frustrated Confederate efforts to engage the Union forces; on one occasion in 1864 it came close to causing more fatalities and led to the capture of some troops, the loss of all of their boats and provisions, and a forced retreat inland. Once again, the weather further ensured that no significant military battles would be recorded along this stretch of the Gulf coast during the Civil War. However, the absence of notable battles does not detract from the high importance of the naval blockade in Union efforts to contain the Confederate ability to obtain supplies and goods or the Confederacy's recognition of the need to evade, and frequent success in running, the blockade.

METEOROLOGICAL SUMMARY AND CONCLUSIONS.

Meteorologically, Hurricane “Amanda” is the only documented U.S. landfalling hurricane in the month of May and is nearly two weeks earlier than the next earliest U.S. landfalling hurricane—that of Hurricane Alma on 9 June 1966 (Fig. 4). Hurricane Amanda is the earliest arriving U.S. landfalling hurricane on record in any hurricane season. This is a reminder to Gulf Coast residents to the possibility, however small, of a hurricane outside of the main hurricane season. Other “near miss” hurricanes along the U.S. coastline in the month of May have occurred on 29 May 1908 (tropical storm force winds felt at Hatteras) and on 21 May 1951 a hurricane was centered off the North Carolina coast (and made an earlier landfall in the northernmost islands of the Bahamas). Tropical Storm Beryl had 60-kt winds at landfall on 28 May 2012 when making landfall at Jacksonville Beach, Florida, and is worthy of mention since it approached hurricane strength and a central pressure of 995 hPa (29.38”). Therefore, the risk of a May hurricane is real and not limited to the Gulf Coast. U.S. Naval forces and the coastal populations of the United States were also fortunate that during the Civil War there were no major hurricanes that made landfall anywhere in the United States.

The hurricane caused the deaths of at least 72 people on land (and 110 on both land and sea when the deaths on the *Soler* are added). This ranks it at number 27 in the deadliest U.S. hurricanes behind Hurricane Betsy in 1965 (75 deaths) and number 28 if Hurricane Sandy of 2012 is treated as a hurricane at landfall. This total does not include the 17 deaths on the *CSS Chattahoochee* since the role of weather is uncertain in the events leading up to the boiler explosion. If the high end of 150 deaths can subsequently be confirmed it would tie at number 21 with the Indianola hurricane of 1886. The death toll may

Dates of First US Landfall Hurricane, 1851-2012

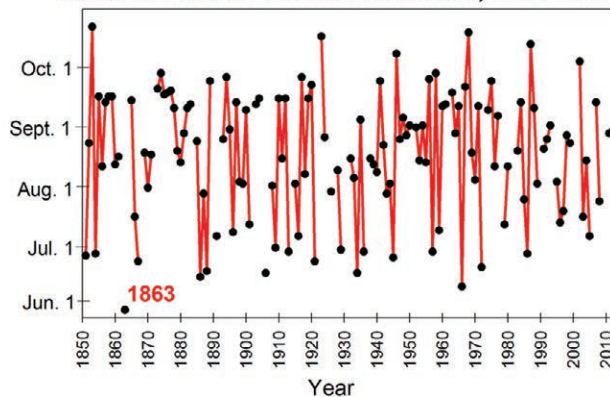


Fig. 4. Time series of the first date of a U.S. landfalling hurricane from 1851 to 2012. Data are from the HURDAT dataset (available online at www.aoml.noaa.gov/hrd/hurdat/). The dot for 1863 shows the date is the earliest landfalling U.S. hurricane on record, being 13 days earlier than Hurricane Alma in 1966.

have been higher had this storm arrived in peacetime as portions of the coastal population had moved inland because of the Union blockade. The blockade ended normal peacetime commerce and most adult men were serving in the military.

Our results also highlight the well-known gaps in the North Atlantic official tropical cyclone records in the nineteenth century (Landsea et al. 2004). However, our results indicate that incomplete U.S. landfall records are not simply due to the occurrence of tropical cyclones in lightly populated coastal areas. The eye of Hurricane Amanda passed over the town of Apalachicola and through the Union blockading force in the area. Instead, previous hurricane compilers simply missed a storm that was reported in the press, including the *New York Times* of 17 June 1863. This indicates that population-based estimates of missing tropical cyclones (Landsea et al. 2004) are only a starting point for estimating the likelihood of false negatives in storm detection in any tropical cyclone basin. Other factors such as a functioning press and the presence of war or civil strife will also increase the likelihood of undercounting tropical cyclones. Previous researchers have also been restricted by their access to data sources, the tendency to accept previous work as being sufficiently complete and accurate, assumptions about the seasonality of tropical cyclones, and the extensive work required to rediscover historical hurricanes and tropical storms.

There is also caution needed in interpreting tropical cyclone metrics such as season length (Kossin 2008). The latest U.S. landfalling hurricane on 1 December 1925 was changed by the Atlantic

basin Hurricane Database (HURDAT) committee to a tropical storm, which shifts the latest date for a U.S. landfalling hurricane to 21 November 1985 (Hurricane Kate). Our results move forward by 13 days the earliest U.S. landfalling hurricane in the spring. Basinwide statistics are also susceptible to a few outlier storms and otherwise incomplete information.

Our results also reemphasize the always provisional nature of even the most complete datasets such as HURDAT. Paleo-hurricane reconstructions from northwest Florida can benefit from reconsidering this new storm in the interpretation and calibration of existing modern sediment records (e.g., Lane et al. 2011) while other users of HURDAT for Atlantic paleo-hurricane reconstructions regions outside of the United States are working with incomplete records on frequency and intensity that extend into the twentieth century.

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